DLR's near real-time radar information for Antarctic research vessels

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Motivation & Infrastructure

On their expeditions through sea ice covered areas even vessels of high ice class or icebreakers could get into trouble. Reliable information from earth orbiting satellites are therefore highly desirable. The German satellites TerraSAR-X (TSX) and TanDEM-X (TDX) are capable to deliver precise information about the ice cover, independent of the time of day and cloud coverage. The German Antarctic Receiving Station (GARS) O'Higgins of the German Aerospace Center (DLR) (Fig. 1) is equipped with near-real time (NRT) processing capability for the TSX/TDX data. This expansion of the overall TSX/TDX ground segment enables NRT sea ice information support to research vessels in the Southern Ocean.

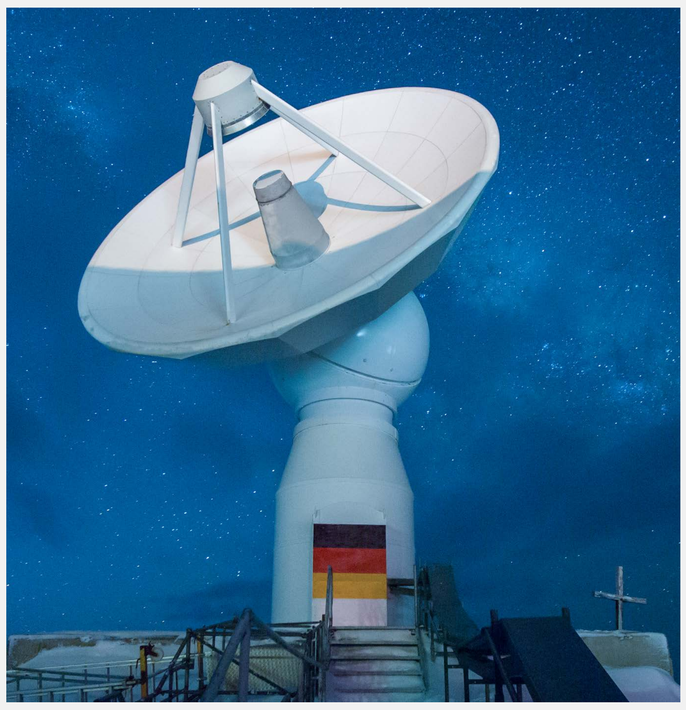

Fig. 1: Antenna system of DLR's German Antarctic Receiving Station (GARS) O'Higgins at the northern tip of the Antarctic Peninsula.

TSX-NRT operation chain

The Earth Observation Center (EOC) of the DLR covers the entire remote sensing spectrum from data reception to processing, as well as developing new information products. This makes it possible to put new developments into practice directly at the receiving facility for NRT services (Fig. 2).

Based on a user request, TSX acquisitions are configured according to user's requirements and are commanded to the satellite. The data are received and processed at the TSX/TDX Antarctic ground station GARS O'Higgins.

For further information on GARS O'Higgins see:

Klügel et al., 2015: Earth and space observation at the German Antarctic Receiving Station O'Higgins. Polar Record 51, 590–610.

or use the QR-Code to watch the **GARS O'Higgins image film**

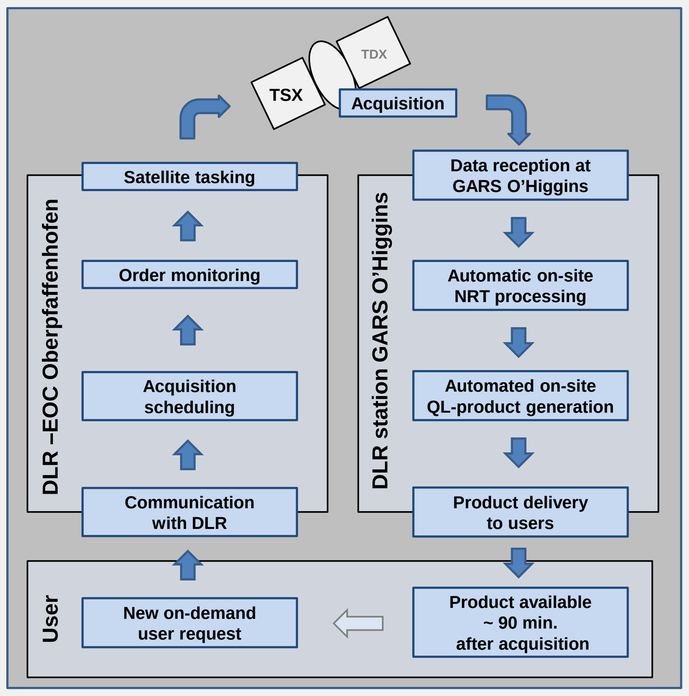

Fig. 2: Application scheme of the on-demand TSX-NRT support.

The delivered data product comprises a KMZ-file and a geocoded PNG image at reduced file sizes of ~ 2MB. The spatial resolution of these Quick-look products range from 7 m to 130 m and depend on the size of the acquired area and the requested TSX acquisition mode.

Examples & Performance

A couple of test campaigns highlighted significant benefits of the provided on-demand NRT service for Antarctic ship expeditions. Ship routes can be optimized and decisions about positions for sampling sites can be supported. Furthermore, this system is also suitable to detect and observe glacier crevasses along land traverses.

A visual comparison of the sea ice information given by the onboard ice radar of R/V Polarstern (left) in relation to the TSX image (right) is shown in Fig. 3. The red line indicates a section of the PS96 cruise track.

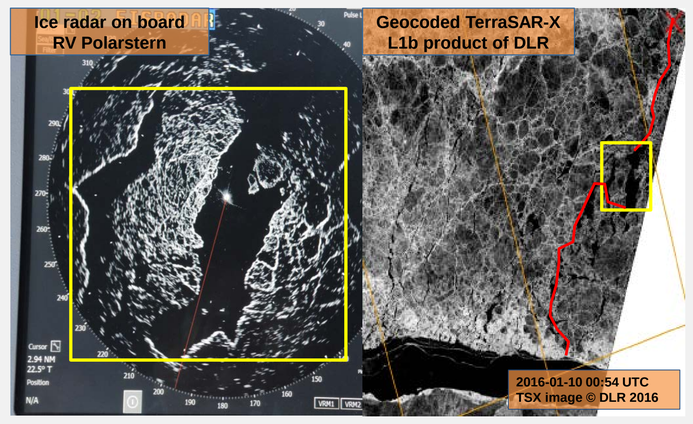

Fig. 3: Ice RADAR onboard R/V Polarstern (left) and TSX image (right)

Fig. 4 shows the performance statistic with the duration between image acquisition and downlink (blue) and the processing and delivery times (red).

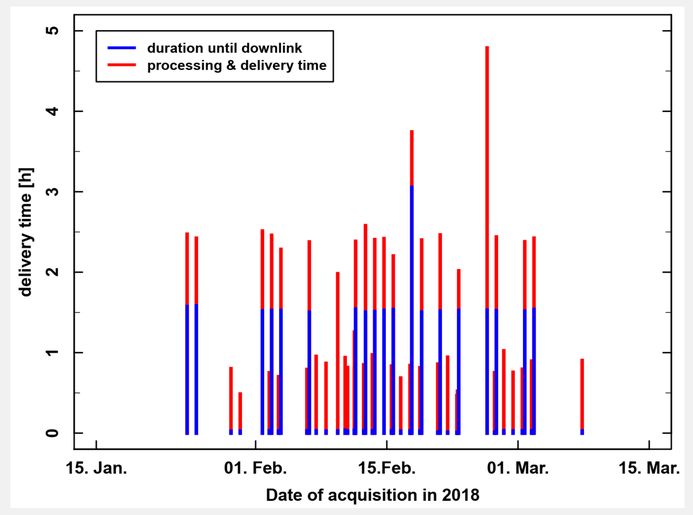

Fig. 4: NRT performance statistics during AWI Exp. PS111, Weddell Sea.

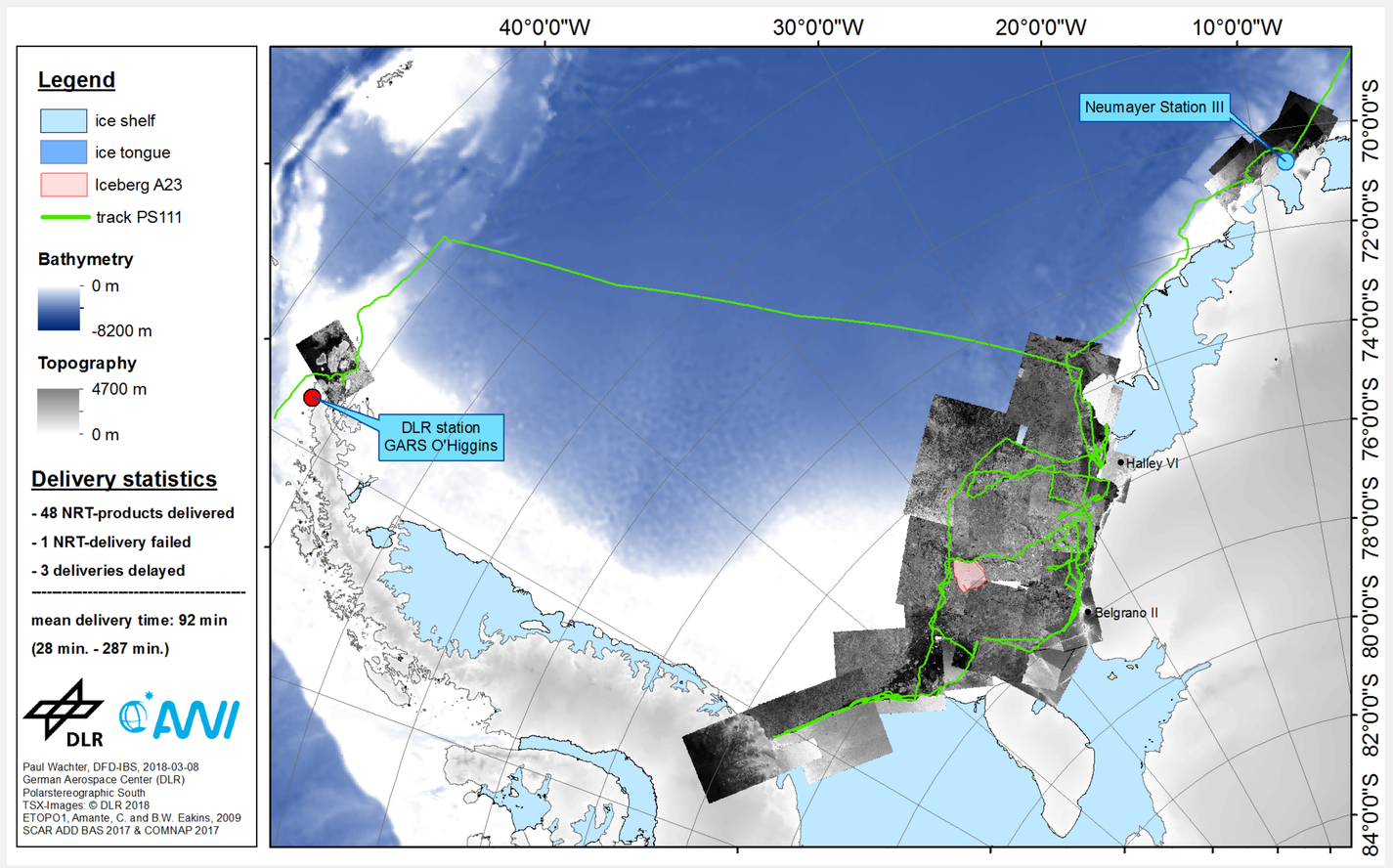

Fig. 5: Vessel Support for R/V Polarstern during PS111 expedition from January to March 2018.

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